

SCANNED

**UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS**

CONDENSING HEAT EXCHANGER, dba)
POWER EQUIPMENT SYSTEMS, INC.)
Plaintiffs)
-against-)
COMBUSTION AND ENERGY SYSTEMS, Ltd.)
Defendant)

CIVIL ACTION NO.

04-30084-KPN

DOCKETED

COMPLAINT AND JURY DEMAND

Plaintiff Condensing Heat Exchanger, dba Power Equipment Systems, Inc. (“CHX”) for its complaint against defendant Combustion and Energy Systems, Ltd. (“ConDex”), states as follows:

INTRODUCTION

1. This action is based upon the infringement by ConDex of U.S. Patent No. 4,776,391 (“391 Patent”) and U.S. Patent No. 4,669,530 (“530 Patent”) in violation of the rights of CHX under the patent laws of the United States.

THE PARTIES

2. CHX is a New York corporation having its principle place of business at 900 Commerce Drive, P.O. Box 897, Clifton Park, NY 12065.
3. ConDex is a Canadian company with its principal place of business at 25 Royal Crest Court, Suite 110, Markham, Ontario, Canada L3R9X4.

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JURISDICTION AND VENUE

4. This court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. § 1338(a).
5. This court has personal jurisdiction over ConDex because ConDex has committed acts of patent infringement in this district by making, using, selling, importing and/or offering to sell infringing products in violation of 35 U.S.C. § 271(a).
6. Venue properly lies in this district pursuant to 28 U.S.C. §§ 1391(c) and 1400(b). ConDex is subject to personal jurisdiction in this district and has committed acts of infringement within this district.

OWNERSHIP

7. The following United States Letters Patents were duly and legally issued, and assigned to CHX. : U.S. Patent No. 4,669,530 and U.S. Patent No. 4,776,391.
8. The ‘530 Patent, a copy of which is attached as **Exhibit A**, issued June 2, 1987. The inventor of the ‘530 Patent, Donald F. Warner, duly assigned the patent to Heat Exchangers, Inc., of Latham, New York, which duly assigned its rights to CHX.
9. The ‘391 Patent, a copy of which is attached as **Exhibit B**, issued October 11, 1988. The inventor of the ‘391 Patent, Donald F. Warner, duly assigned the patent to Heat Exchangers, Inc., which duly assigned its rights to CHX.
10. CHX is the present owner of all rights, title and interest in the ‘530 Patent for a HEAT EXCHANGER METHOD AND APPARATUS and the ‘391 patent for a HEAT EXCHANGER METHOD AND APPARATUS. ConDex has been placed on actual notice of CHX’s rights under the patent laws in a letter dated on or about January 30, 2002.

COUNT I - INFRINGEMENT OF THE '530 PATENT

11. ConDex has infringed and continues to infringe plaintiff's '530 Patent by making, using, offering for sale, or selling within the United States heat exchanger products, or importing heat exchanger products into the United States constructed as described and claimed in plaintiff's '530 Patent.
12. Defendant continues to advertise infringing ConDex units on the internet at www.combustionandenergy.com.
13. Defendant offered to sell, imported and sold a ConDex unit to Holyoke Gas and Electric, which has a principle place of business at 99 Suffolk Street, Holyoke, Massachusetts 01040 in violation of the '530 patent.
14. On information and belief, Holyoke Gas and Electric made a Request for Response (Rev. 2) on December 21, 2001 regarding the Energy Management Project for high efficiency boilers.
15. On information and belief, Holyoke Gas and Electric held a bidder meeting on January 10, 2002 about the Energy Management Project for high efficiency boilers.
16. On information and belief, ConDex was an attendee and/or participating bidder at the bidder meeting of the Energy Management Project for high efficiency boilers held on January 10, 2002.
17. On information and belief, ConDex won a bid to sell ConDex units to Holyoke Gas and Electric.
18. Infringement of plaintiff's '530 Patent is and at all times has been, deliberate, willful, intentional, and with full knowledge of the existence and validity of plaintiff's '530

Patent.

COUNT II - INFRINGEMENT OF THE '391 PATENT

19. ConDex has infringed and continues to infringe plaintiff's '391 Patent by making, using, offering for sale, or selling within the United States heat exchanger products, or importing heat exchanger products into the United States constructed as described in plaintiff's '391 Patent.
20. Defendant offered to sell, imported and sold a ConDex unit to Holyoke Gas and Electric, which has a principle place of business at 99 Suffolk Street, Holyoke, Massachusetts 01040 in violation of the '391 patent.
21. Infringement of plaintiff's '391 Patent is and at all times has been, deliberate, willful, intentional, and with full knowledge of the existence and validity of plaintiff's '391 Patent.
22. On information and belief, Holyoke Gas and Electric made a Request for Response (Rev. 2) on December 21, 2001 regarding the Energy Management Project for high efficiency boilers.
23. On information and belief, Holyoke Gas and Electric held a bidder meeting on January 10, 2002 about the Energy Management Project for high efficiency boilers.
24. On information and belief, ConDex was an attendee and/or participating bidder at the bidder meeting of the Energy Management Project for high efficiency boilers held on January 10, 2002.
25. On information and belief, ConDex won a bid to sell ConDex units to Holyoke Gas and Electric.

WHEREFORE, plaintiff CHX requests that judgment be entered against defendant ConDex in favor of plaintiff CHX as follows:

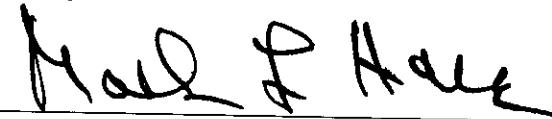
- a. Awarding preliminary and permanent injunctive relief against further infringement of the '391 Patent and '530 Patents by defendant, its officers, agents, servants, employees, attorneys and those in active concert with it pursuant to 35 U.S.C. § 283;
- b. Awarding plaintiff CHX damages adequate to compensate it for defendant's infringement of the '391 Patent and the '530 Patent, and not less than a reasonable royalty for use made of plaintiff's inventions by defendant, together with prejudgment interest pursuant to 35 U.S.C. § 284.
- c. Awarding plaintiff CHX treble damages for defendant's willful and intentional infringing acts pursuant to 35 U.S.C. § 284.
- d. Finding this case exceptional within the meaning of 35 U.S.C. § 285 and awarding to plaintiff CHX its reasonable attorneys' fees, costs and expenses of this action; and
- e. Such other relief as justice requires.

JURY DEMAND

Plaintiff demands a trial by jury on all issues properly tried to a jury.

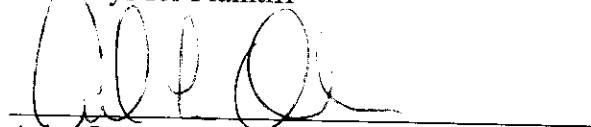
Date: April 29, 2004

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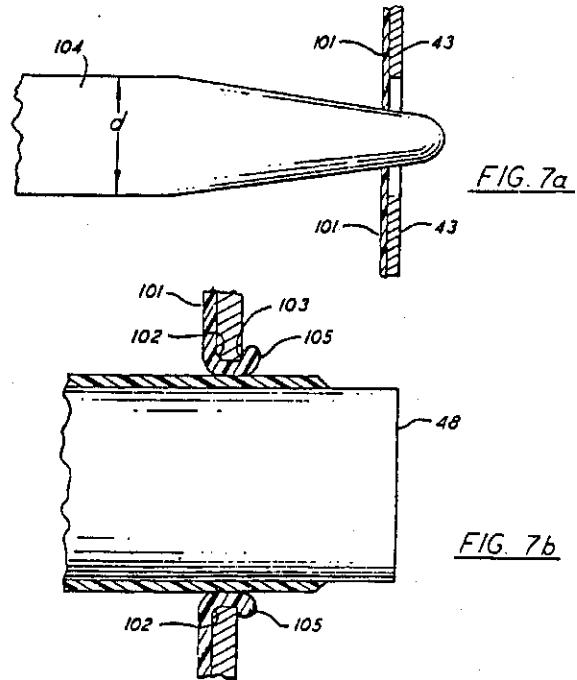
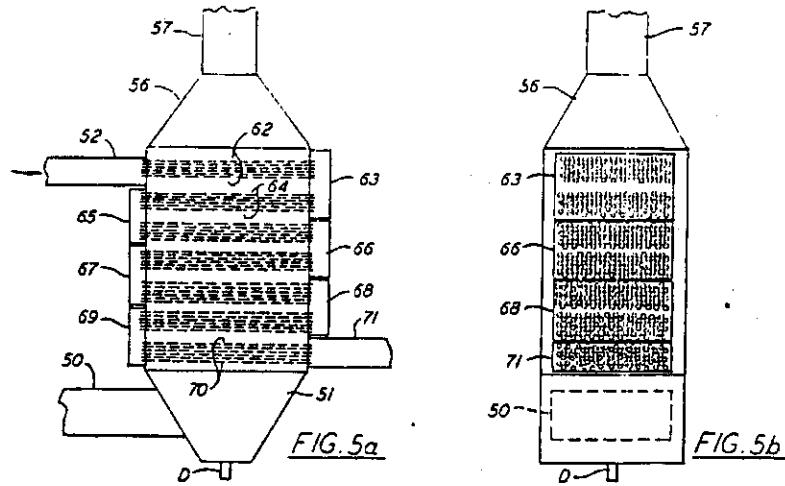
Arlen L. Olsen
NDNY Bar Roll No.: 507492
3 Lear Jet Lane, Suite 201
Latham, NY 12110
Telephone: (518) 220-1850

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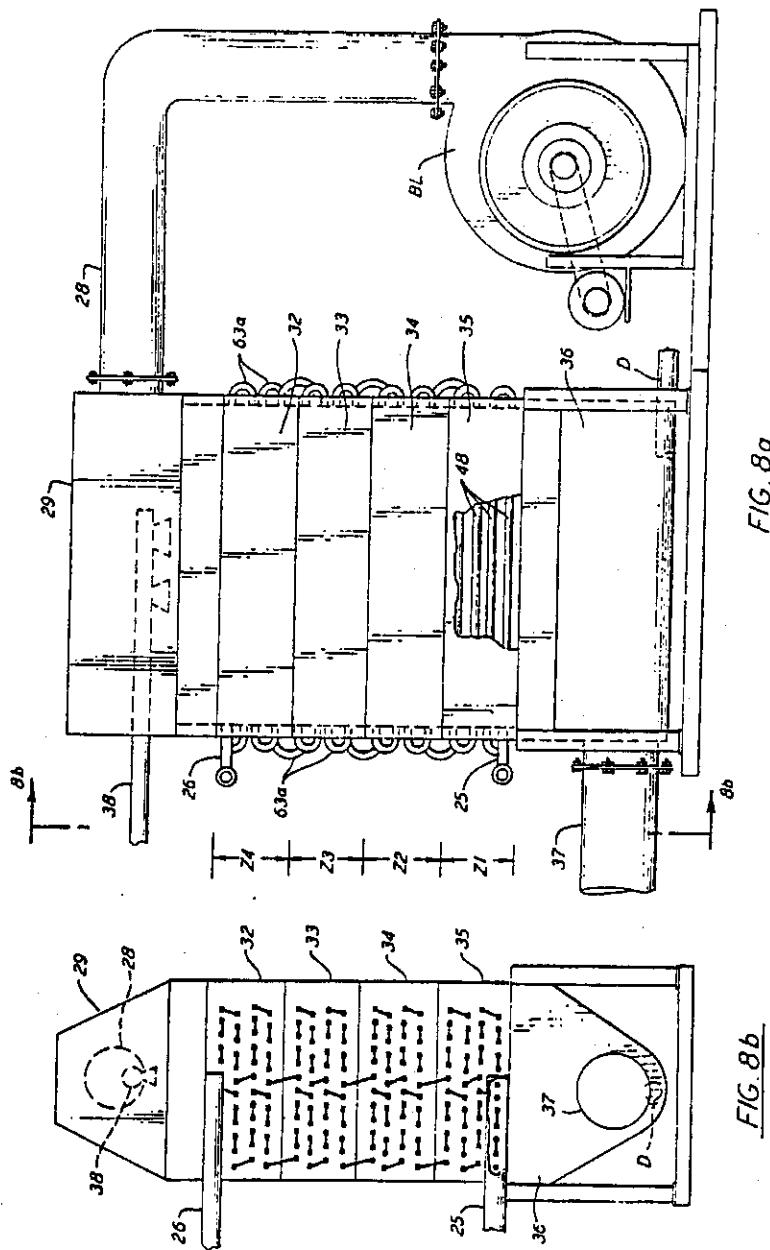


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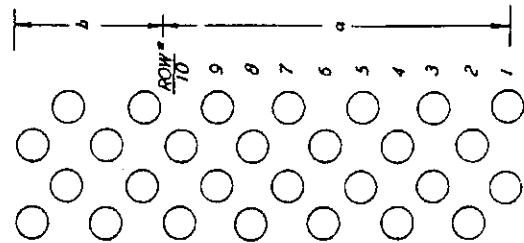


FIG. 9

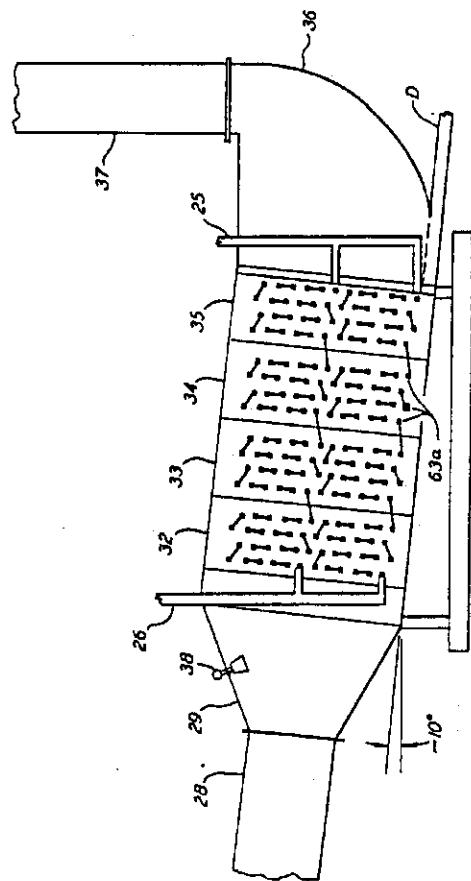


FIG. 8c

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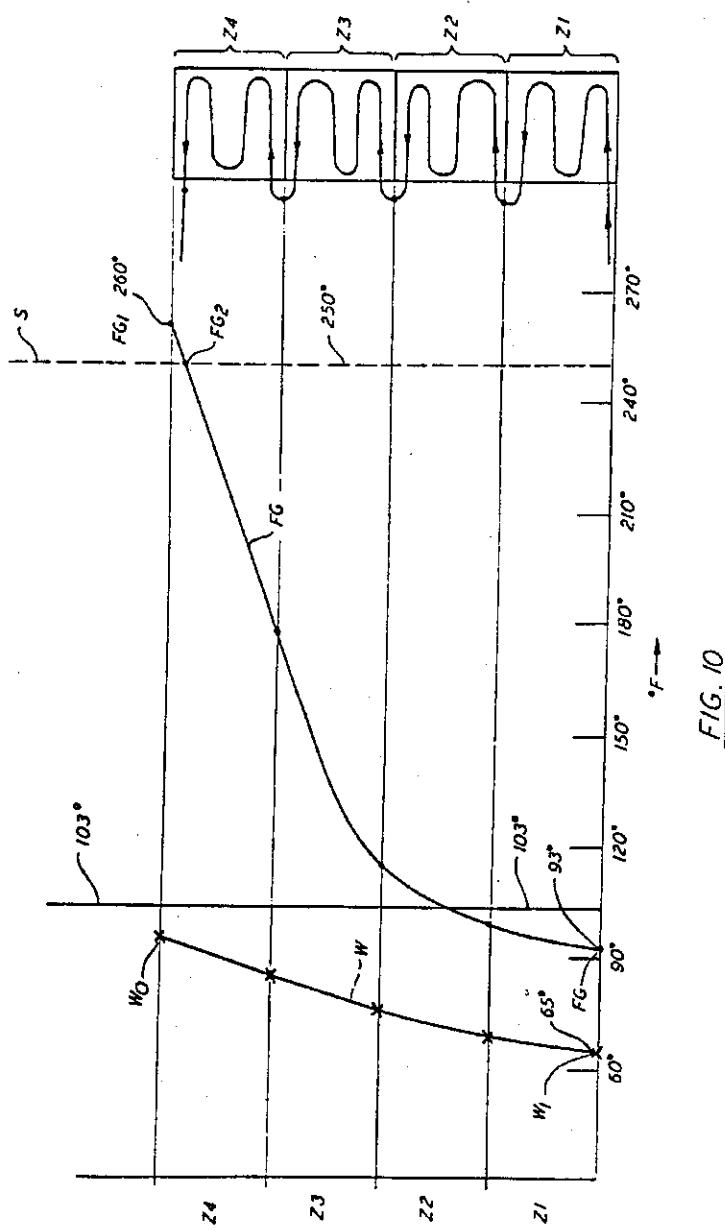


FIG. 10

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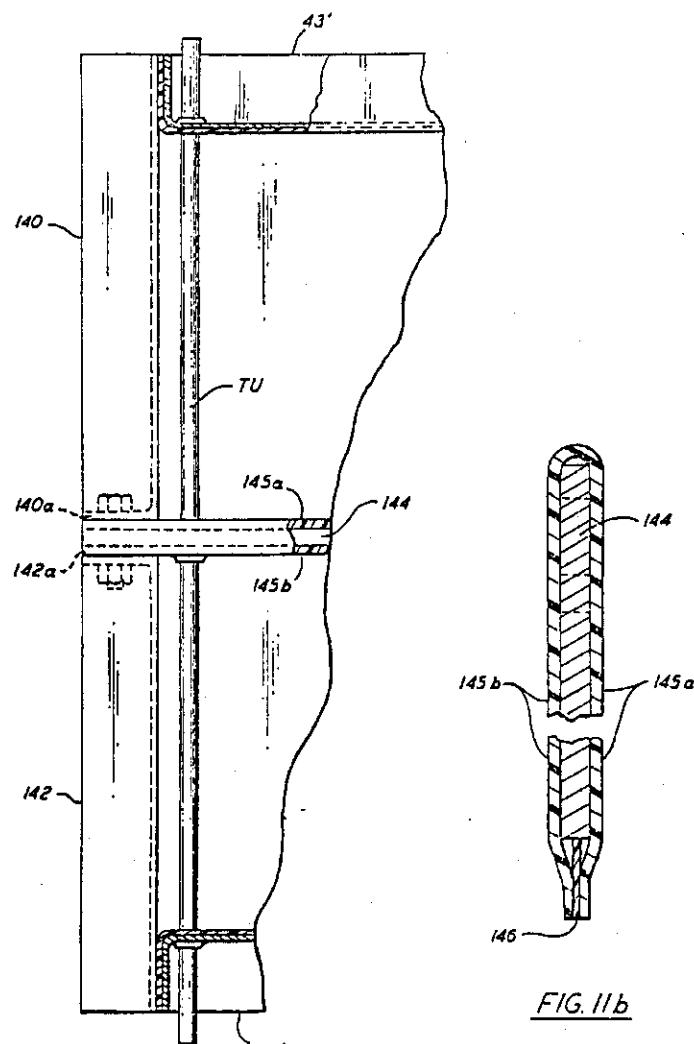


FIG. 11a

FIG. 11b

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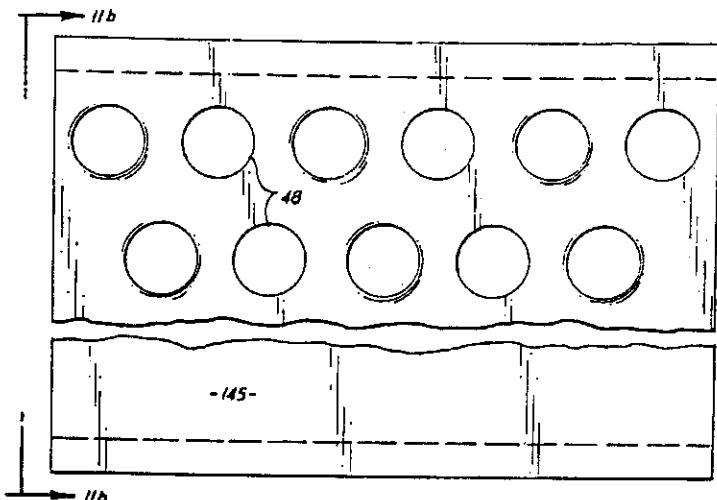


FIG. 11d

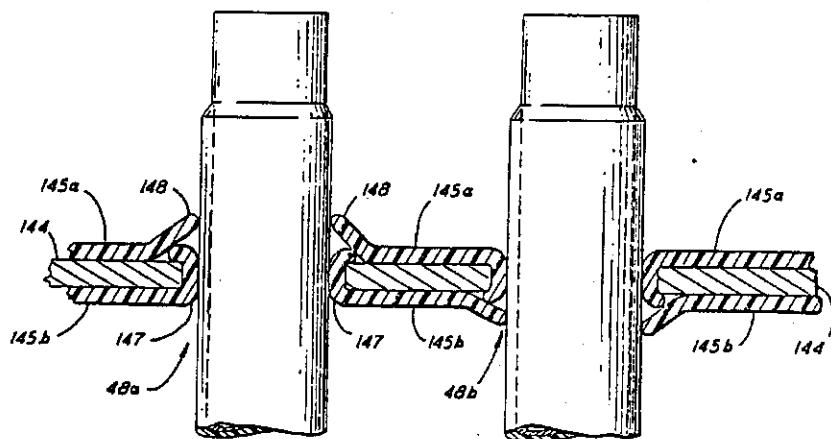


FIG. 11c

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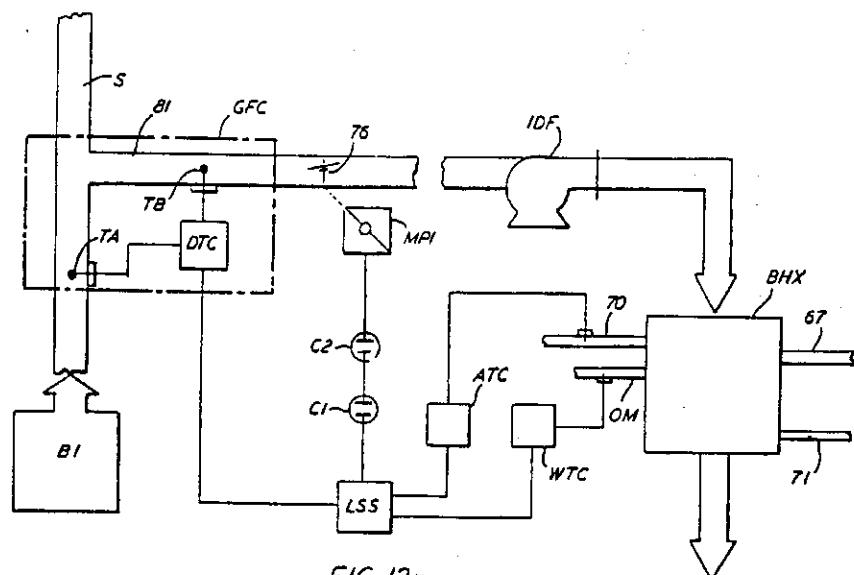


FIG. 12a

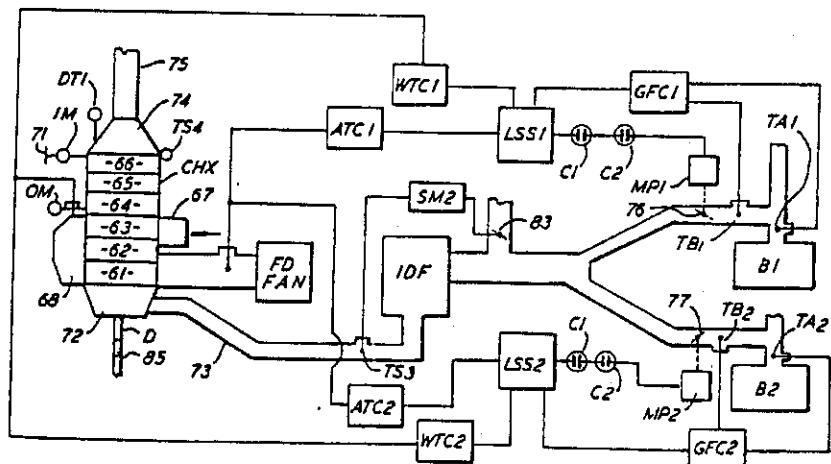


FIG. 12b

4,776,391

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HEAT EXCHANGER METHOD AND APPARATUS

This application is a division of my copending Application Ser. No. 810,557 filed Dec. 19, 1985, now U.S. Pat. No. 4,669,530 granted June 2, 1987, which was a division of Application Ser. No. 671,494 filed Nov. 14, 1984, now U.S. Pat. No. 4,577,380 granted Mar. 25, 1986 which was a division of Application Ser. No. 406,774 filed Aug. 10, 1982, now U.S. Pat. No. 4,487,139 granted Dec. 11, 1984 which was a continuation-in-part of Application Ser. No. 252,927 filed Apr. 9, 1981, now abandoned, and Application Ser. No. 81,789 filed Oct. 4, 1979, now abandoned.

My invention relates to exhaust gas treatment method and apparatus, and more particularly, to improved method and apparatus useful not only for recovering large amounts of heat from various industrial exhaust gases, but also for simultaneously removing substantial amounts of particulate matter and corrosive products of combustion from such exhaust gases, thereby to reduce air pollution from stack emissions. The invention is particularly directed toward such treatment of sulfur-containing exhaust gases, such as those typically produced by burning oil or coal in furnaces, though it will become apparent that the invention will be useful in a wide variety of other applications. A primary object of the invention is to provide method and apparatus which are useful for recovering a substantially larger percentage of the heat contained in an exhaust gas than that recovered in typical prior systems, which has very important economic implications, due to the high costs of fuels. Another important object of the invention is to provide method and apparatus which are useful for removing substantial amounts of particulate matter and corrosive products of combustion from exhaust gases, thereby decreasing pollution. Natural gas, #2 fuel oil, #6 fuel oil, and coal, generally ranked in that order, produce flue gases containing increasing amounts of sulfur dioxide and sulfur trioxide, and particulate matter, such as soot and silica products. One object of the invention is to provide method and apparatus which is useful in connection with flue gases produced by any of those fuels.

In many applications it is desirable that waste heat be used to preheat a liquid, such as boiler make-up water, or industrial process water as examples, while in many other applications it may be preferred that waste heat be used to preheat a gas, such as air, and in some applications to heat both a liquid and a gas. Another object of the invention is to provide a method which lends itself to preheating of either a liquid or a gas or both a liquid and a gas, and to provide apparatuses which preheat liquid or a gas or both a liquid and a gas.

A very important object of the present invention is to provide method and apparatus which is rugged and reliable, and useful over long periods of time with minimum attention, and minimum requirements for "downtime" for cleaning or repair.

Another more specific object of the invention is to provide a heat exchanger which functions as a self-cleaning gas scrubber as well as recovering increased amounts of heat from an exhaust gas.

It long has been known that the thermal efficiency of a plant or process can be increased by recovering some of the heat energy containing the exhaust gas from a boiler furnace or the like. Flue gas commonly is directed through boiler economizers to preheat boiler

feedwater, and commonly directed through air preheaters to preheat furnace combustion air, in each case providing some increase in thermal efficiency. The amount of heat which it has been possible to recover from flue gas ordinarily has been quite limited, due to serious corrosion problems which otherwise result. Combustion of oil, coal or natural gas produces flue gas having substantial moisture, sulfur dioxide, sulfur trioxide, and particulate matter in the cases of oil and coal. If a heat exchanger intended to recover heat from flue gas condenses appreciable amounts of sulfur trioxide, sulfuric acid is formed, resulting in severe corrosion. The condensed sulfur product can readily ruin usual economizers and air preheaters, and the exhaust stacks associated with them. Thus prior art systems intended to recover heat from flue gas traditionally have been operated with flue gas temperatures scrupulously maintained high enough to avoid condensation of sulfur products.

The temperature at and below which condensation will occur for a flue gas not containing any sulfur oxides, i.e., the dew point due to water vapor only, is usually within the range of 100° F. to 130° F., depending on the partial pressure of water vapor. But the presence of sulfur trioxide even in small amounts, such as 5 to 100 parts per million, drastically increases the temperature at which condensation will occur, far above that for water vapor only. For example, 50 to 100 parts per million of SO₃ may raise the dew point temperature to values such as 250° F. to 280° F., respectfully. Thus it has been usual practice to make absolutely certain that flue gas is not cooled below a temperature of the order of 300° F., in order to avoid condensation and corrosion. Such operation inherently results in an undesirably small portion of the sensible heat energy being extracted from the flue gas, and in absolutely no recovery of any latent heat energy contained in the flue gas. One concept of the present invention is to provide method and apparatus for recovering heat from a potentially corrosive exhaust gas, such as flue gas, in a manner directly contrary to prior art practices, using a heat exchanger which continuously operates in a "water-condensing" mode, allowing substantial amounts of latent heat, as well as more sensible heat, to be recovered from the exhaust gas. The term "water condensing" is meant to mean that the temperature of a large percentage (and ideally all) of the exhaust gas is lowered not only below the sulfuric acid condensation or saturation temperature, but even below the saturation temperature of water at the applicable pressure, i.e. below the dew point, e.g. 120° F., for water vapor only. In a typical operation of the invention where absolute pressure of the flue gas within a heat exchanger is of the order of 0.2 to 5 inches of water, the temperature of large portions of the flue gas is lowered at least below 120° F. to a temperature of say 75° F. to 100° F., by passing the flue gas through a heat exchanger scrubber unit. The unit continuously condenses a large amount of water from the flue gas, as well as condensing sulfuric acid. Parts within the heat exchanger-scrubber unit which would otherwise be exposed to the corrosive condensate are appropriately lined or coated with corrosion-resistant materials, e.g. a fluoroplastic such as "Teflon" trademark of E.I.DuPont de Nemours & Co., Inc.) to prevent corrosion.

When prior art waste heat recovery systems have been operated with flue gas temperatures (e.g. 250° F.) too near the SO₃ condensation temperature, whether by accident, or during startup, or in attempts to improve

United States Patent [19]

Warner

[11] Patent Number: **4,776,391**
 [45] Date of Patent: **Oct. 11, 1988**

[54] HEAT EXCHANGER METHOD AND APPARATUS

[75] Inventor: Donald F. Warner, Latham, N.Y.

[73] Assignee: Heat Exchanger Industries, Inc.,
Latham, N.Y.

[21] Appl. No.: 33,623

[22] Filed: Apr. 3, 1987

Related U.S. Application Data

[60] Division of Ser. No. 810,557, Dec. 19, 1985, Pat. No. 4,669,530, which is a division of Ser. No. 671,494, Nov. 14, 1984, Pat. No. 4,577,380, which is a division of Ser. No. 406,774, Aug. 10, 1982, Pat. No. 4,487,139, which is a continuation-in-part of Ser. No. 252,297, Apr. 9, 1981, abandoned, which is a continuation-in-part of Ser. No. 81,789, Oct. 4, 1979, abandoned.

[51] Int. Cl.⁴ F28F 13/18; F28B 1/00[52] U.S. Cl. 165/111; 165/133;
165/180; 165/913; 165/909; 165/921[58] Field of Search 165/901, 913, 921, 133,
165/111, 145, 909, 180**[56] References Cited****U.S. PATENT DOCUMENTS**

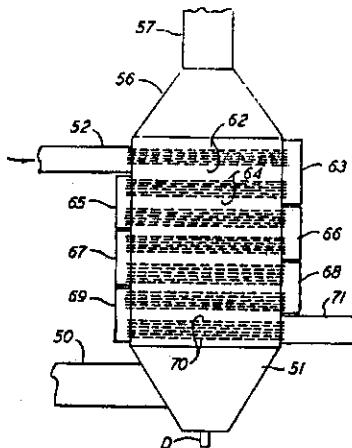
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2,801,830	8/1957	Frisch	165/921
2,838,287	6/1958	Kuhner	165/921
4,286,528	9/1981	Willard	165/901

Primary Examiner—Albert W. Davis, Jr.

Attorney, Agent, or Firm—Richard G. Stephens

[57] ABSTRACT

An exhaust gas containing sulfur trioxide is passed through a first heat exchanger which cools the gas to a temperature which is above the sulfur trioxide dewpoint, so that condensation of sulfur trioxide does not occur in the first heat exchanger, but below a material limit operating temperature of a second heat exchanger, which further cools the gas below the sulfur trioxide dewpoint, whereby the first heat exchanger is protected against corrosion and the second heat exchanger is protected against thermal damage.

5 Claims, 11 Drawing Sheets

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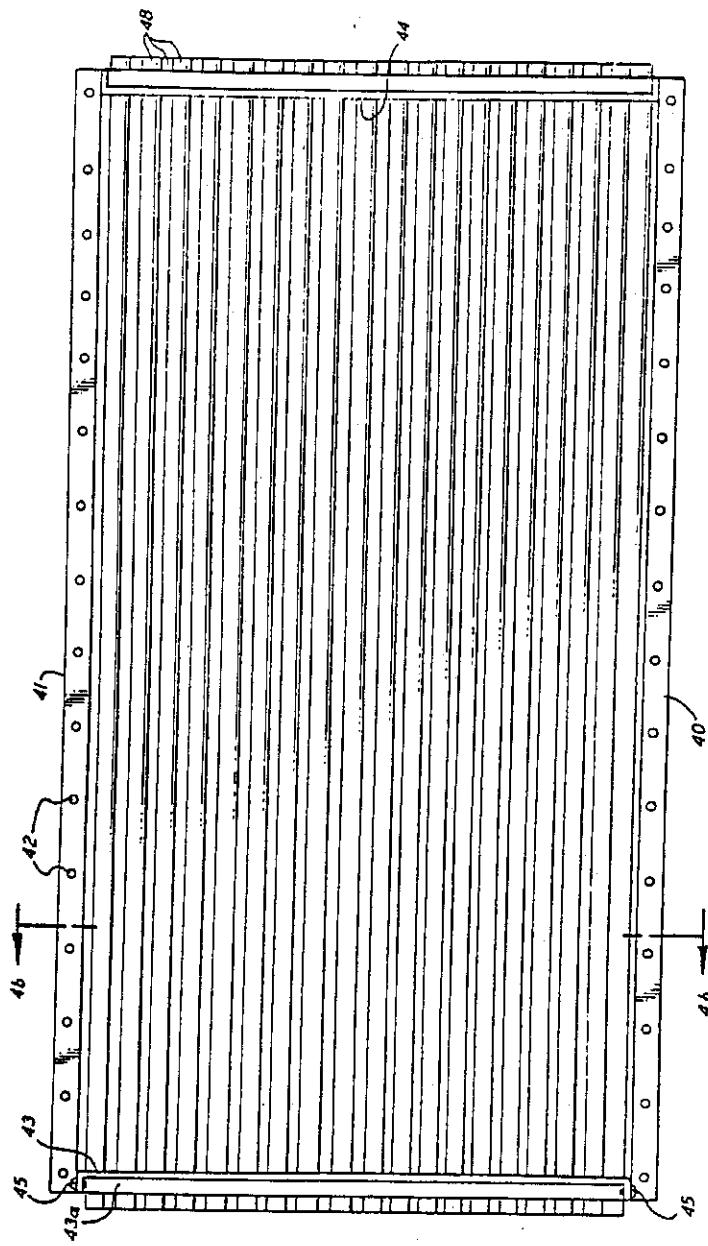


FIG. 4a

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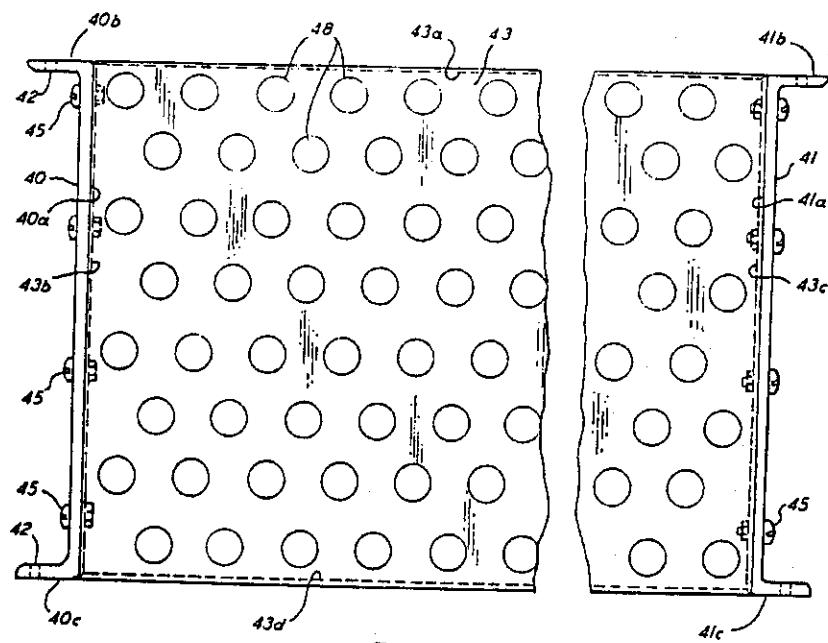


FIG. 4b

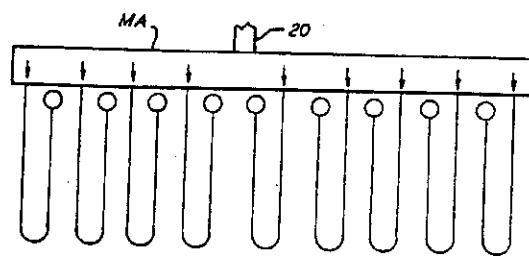


FIG. 4d

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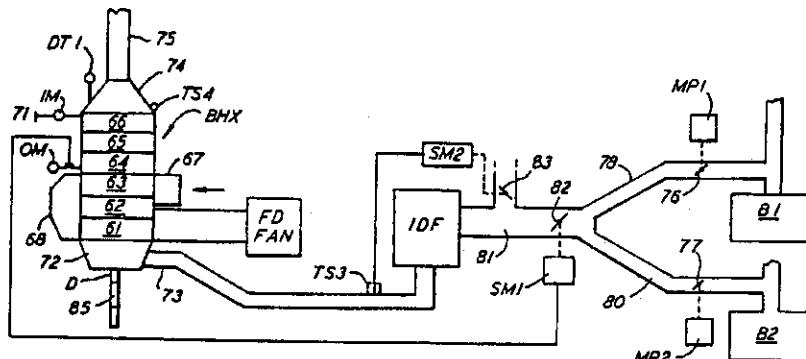
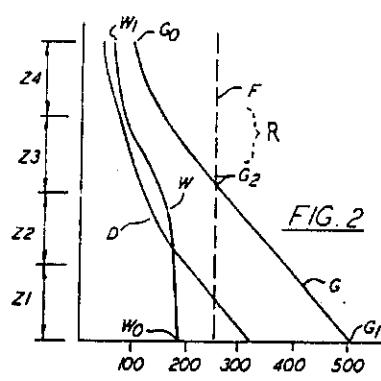
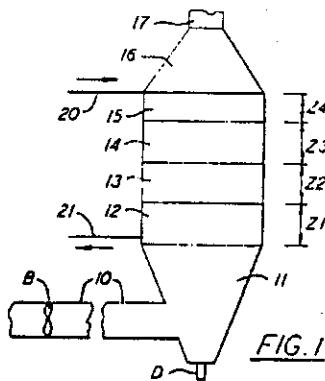


FIG. 6

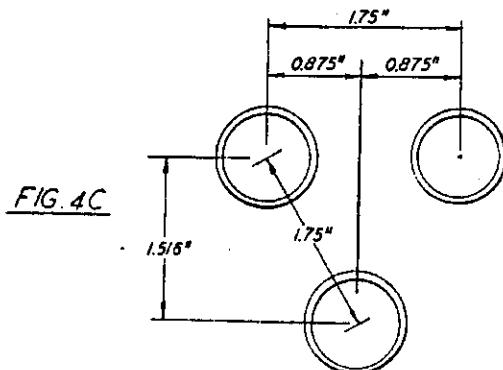


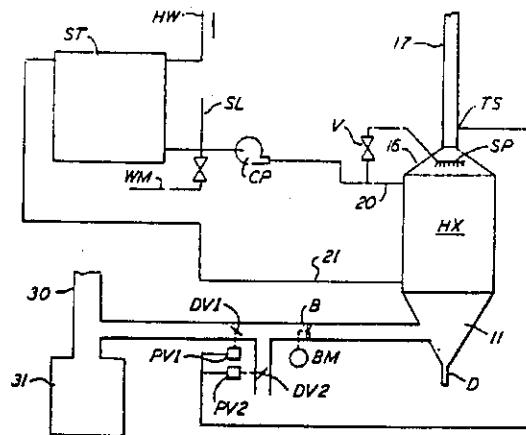
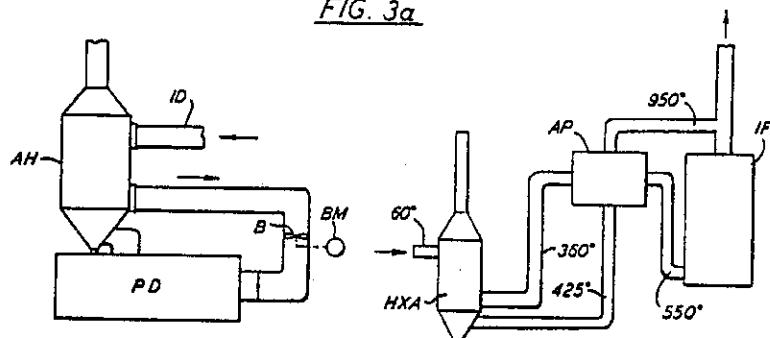
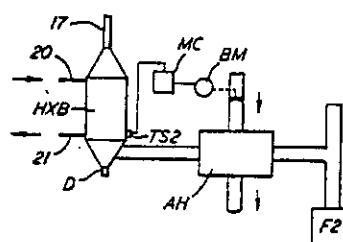
FIG. 4C

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FIG. 3aFIG. 3bFIG. 3cFIG. 3d